

# (12) UK Patent Application (19) GB (11) 2 284 689 (13) A

(43) Date of A Publication 14.06.1995

(21) Application No 9325042.1

(22) Date of Filing 07.12.1993

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(51) INT CL<sup>6</sup>  
G06F 9/24

(52) UK CL (Edition N )  
G4A AFL

(56) Documents Cited  
GB 2204973 A EP 0275510 A2 WO 87/05420 A1

(58) Field of Search  
UK CL (Edition M ) G4A AFL AKBX  
INT CL<sup>5</sup> G06F  
ONLINE DATABASE : WPI

(54) Programming SMART cards.

(57) An IC card back-up and programming device includes a housing with an IC card slot for receiving an IC card and a floppy disk drive. A microprocessor (10) is operable in a program mode to read disk data for programming the IC card. The microprocessor (10) is also operable in a back-up mode, wherein the microprocessor reads data from the IC card and writes the IC card data onto the floppy disk.

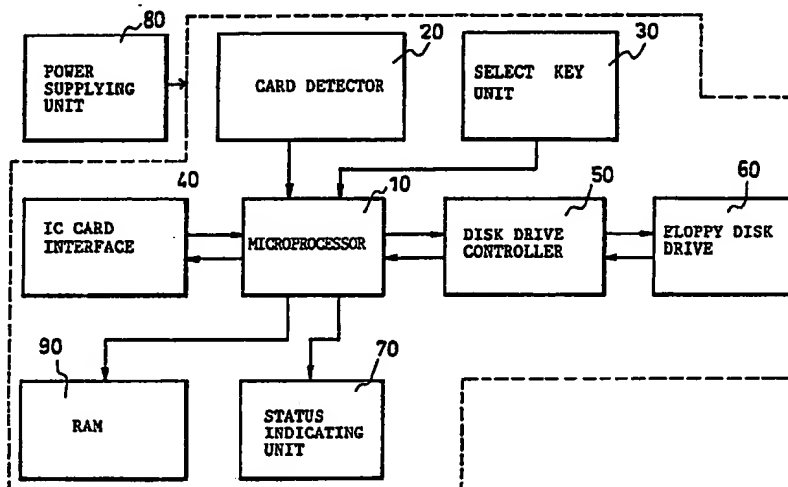


FIG. 4

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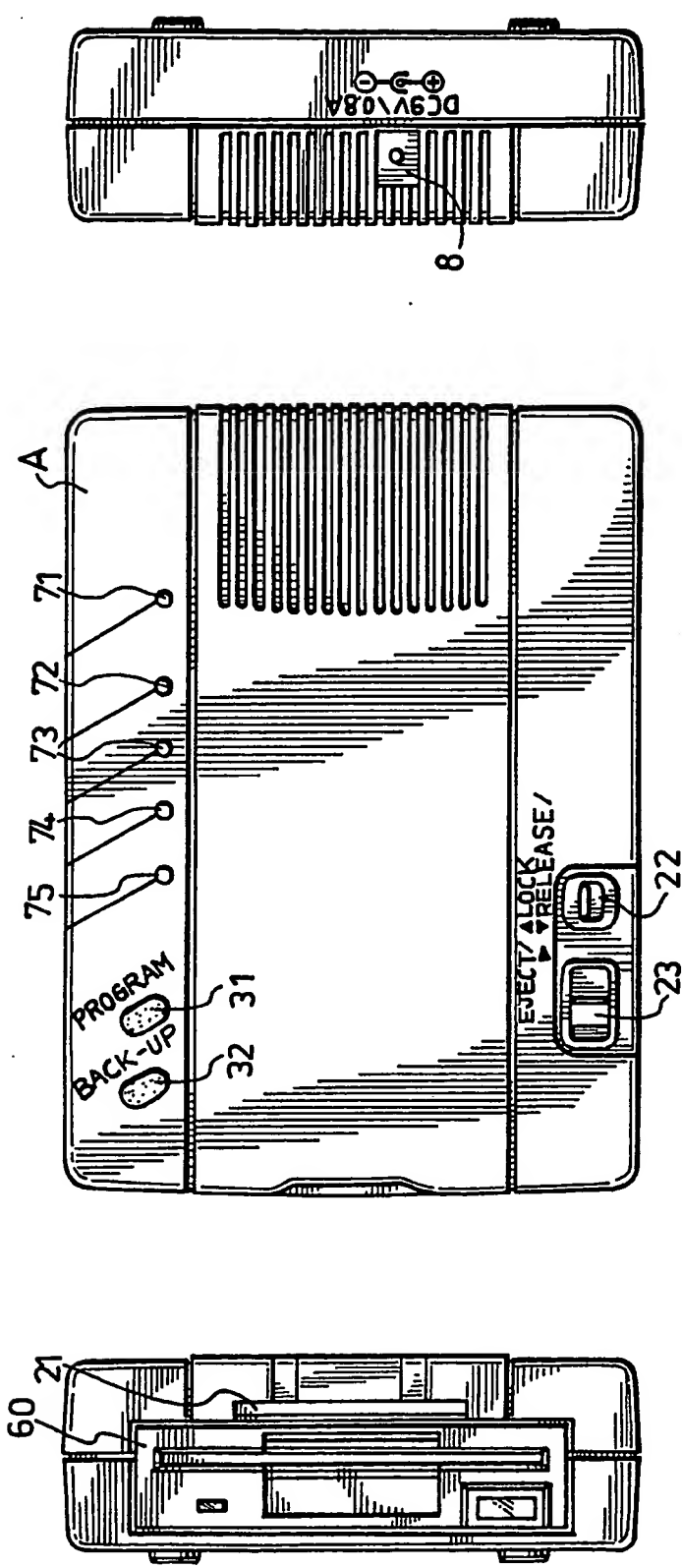


FIG.3

FIG.1

FIG.2

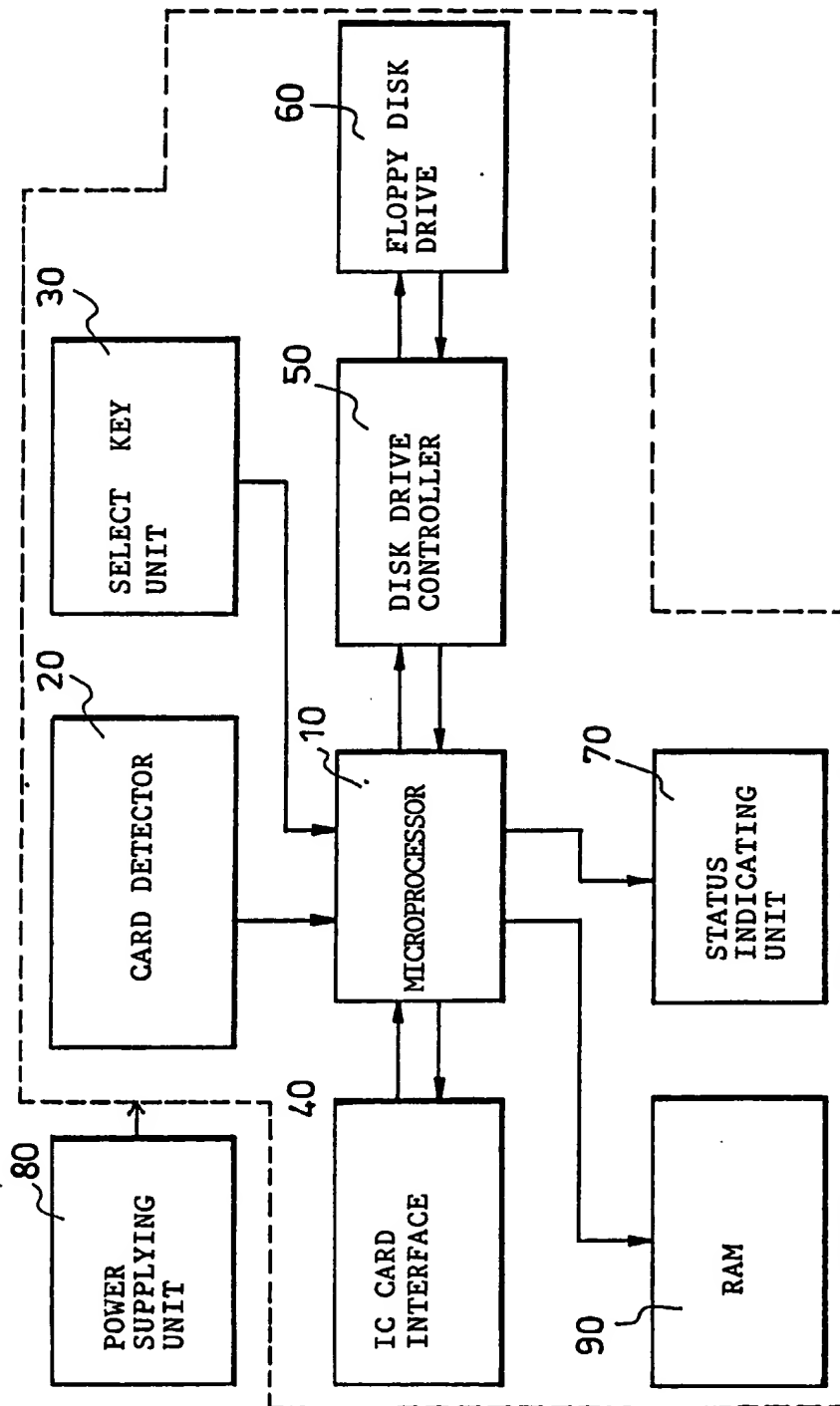


FIG. 4

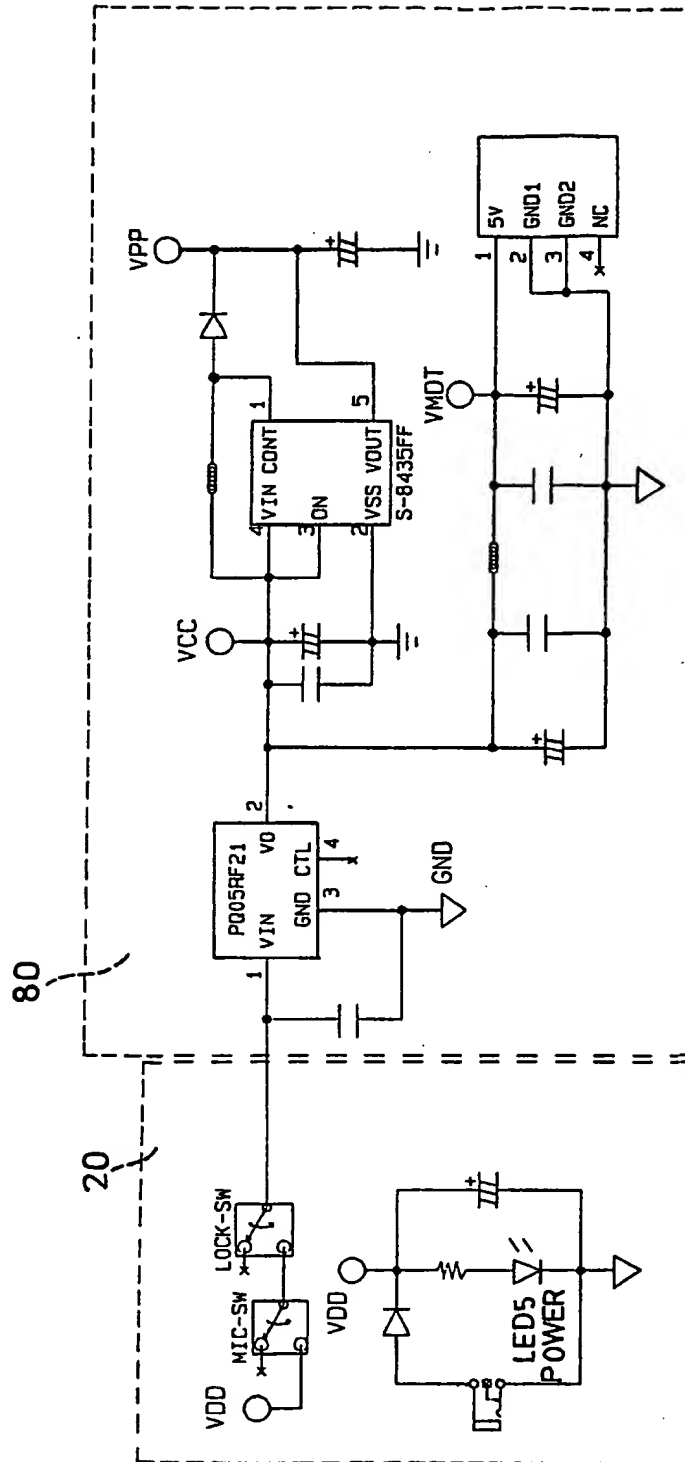


FIG. 5

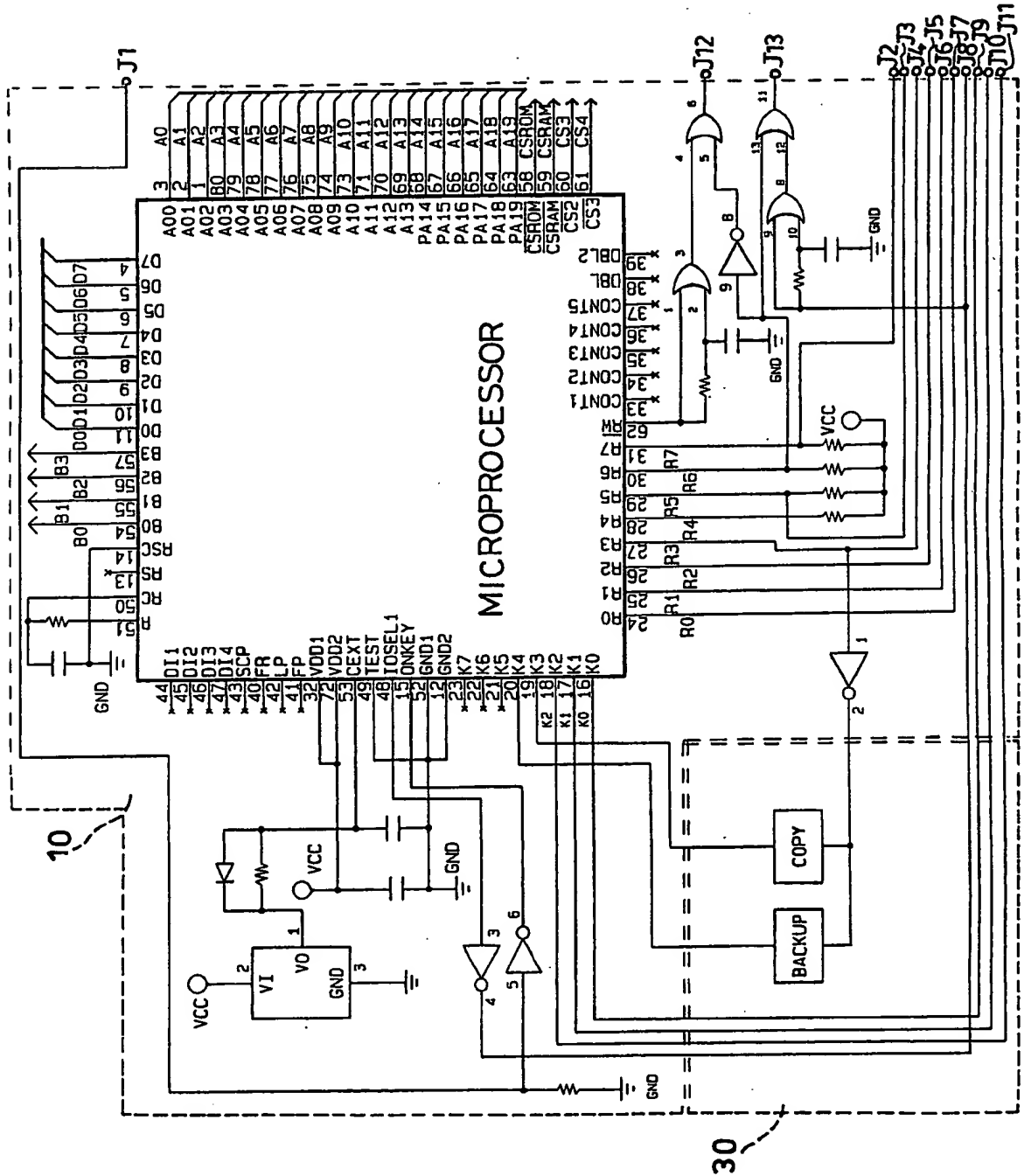


FIG. 6



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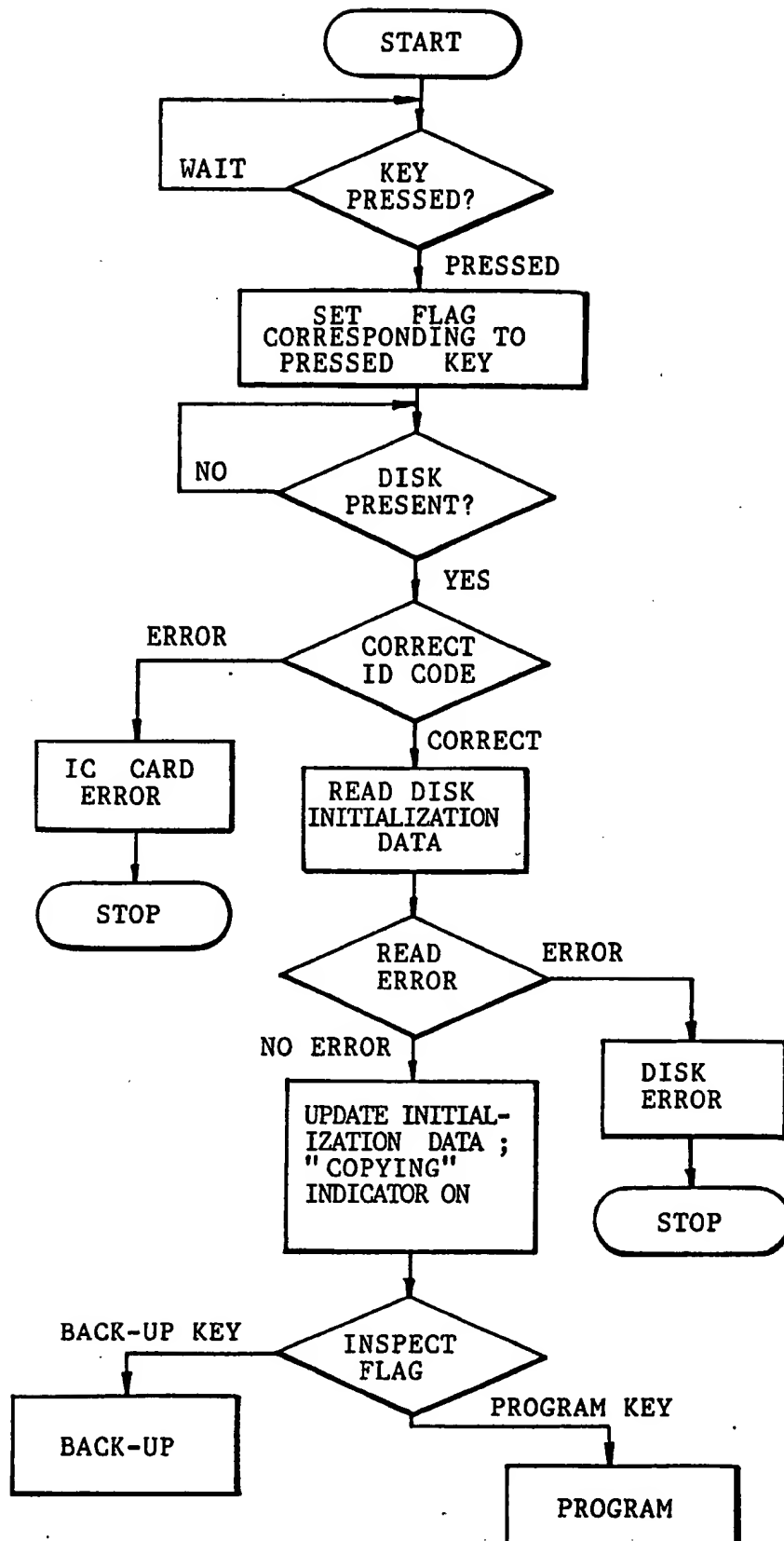


FIG.9



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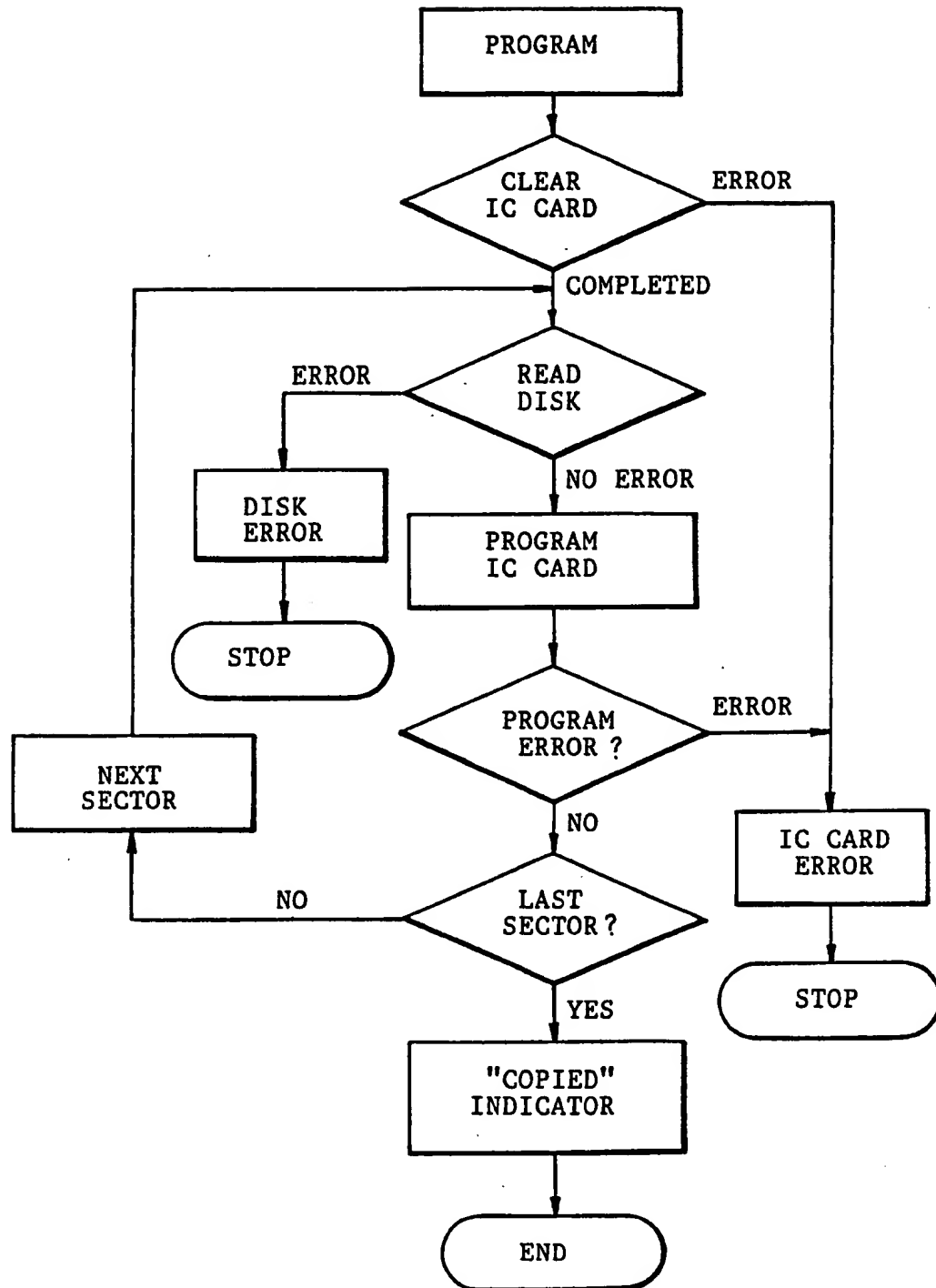


FIG. 10

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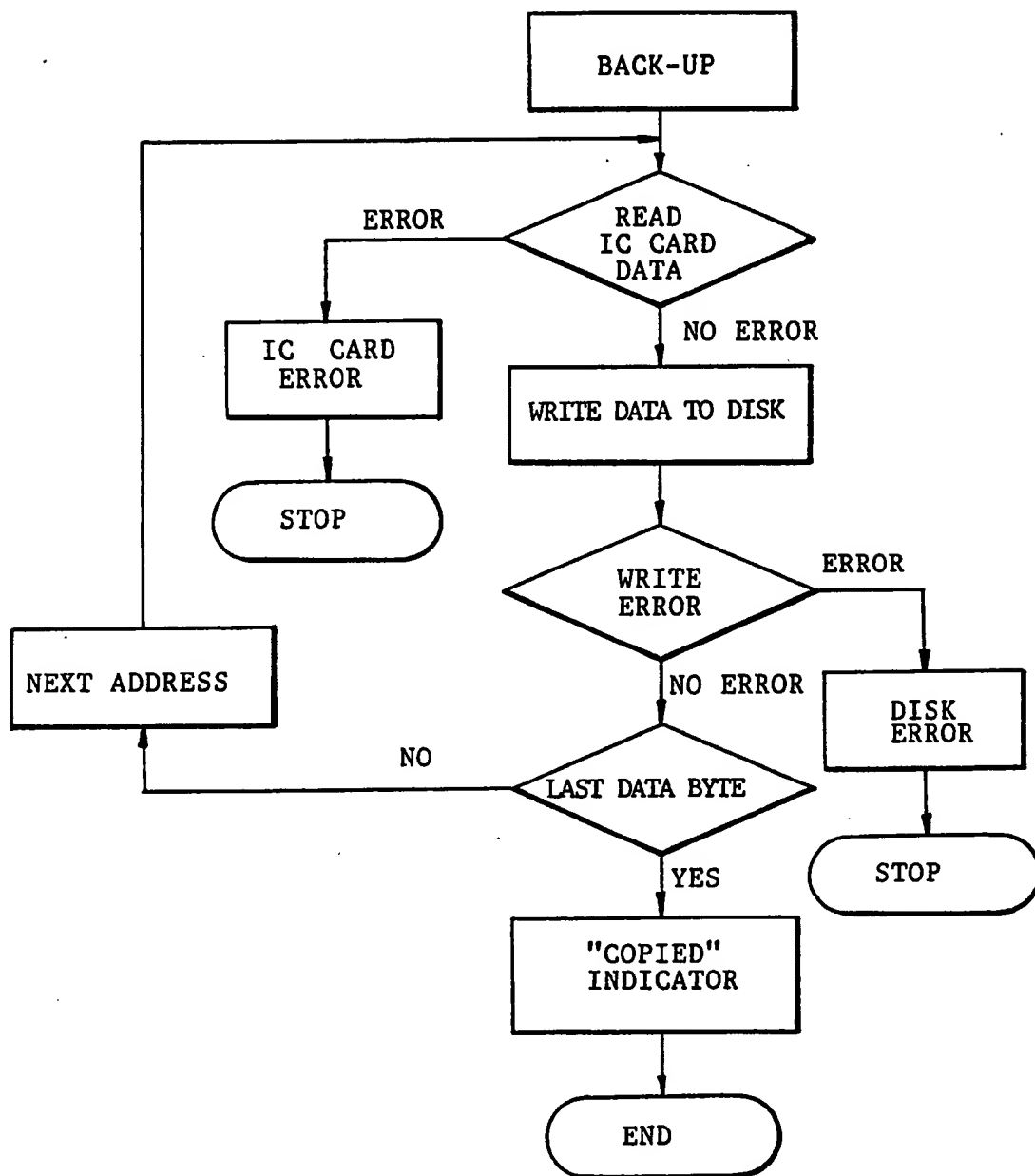


FIG.11

## IC CARD BACK-UP GENERATING AND PROGRAMMING DEVICE

The invention relates to a programming device, more particularly to an IC card back-up generating and programming device which is capable of copying data from an IC card into a floppy disk and vice versa.

Most portable data providing devices, such as electronic dictionaries, employ an IC card to expand its database or to upgrade the functions of the same. Presently, the purchase of several IC cards to enhance the capabilities of the data providing device would require the consumer to shoulder a relatively large expense. The existence of this drawback is due in part to the fact that conventional IC cards cannot be reprogrammed by the consumer if he or she has no more need for the data stored in the IC card.

Therefore, the objective of the present invention is to provide an IC card back-up generating and programming device which is capable of copying data from an IC card into a floppy disk and vice versa. Because unneeded IC cards can be reprogrammed with the use of the present invention, upgrading of a data providing device can be done at a lower cost.

Accordingly, the IC card back-up generating and programming device of the present invention comprises:

a housing provided with an IC card slot for receiving an IC card therein and a floppy disk drive for receiving a floppy disk therein;

an IC card interface unit connectable electrically to the IC card;

a disk drive controller connected electrically to the floppy disk drive;

5 a random access memory;

a microprocessor means connected to the interface unit, the disk drive controller and the random access memory;

10 the microprocessor means being operable in a program mode, wherein the microprocessor means controls the disk drive controller so as to enable the floppy disk drive to read disk data from the floppy disk and provide the disk data to the microprocessor means for storage in the random access memory, and wherein the  
15 microprocessor means retrieves the disk data from the random access memory and programs the IC card with the disk data;

the microprocessor means being further operable in a back-up mode, wherein the microprocessor means reads IC  
20 card data from the IC card and stores the IC card data in the random access memory, and wherein the microprocessor means retrieves the IC card data from the random access memory and controls the disk drive controller so as to enable the floppy disk drive to  
25 write the IC card data into the floppy disk;

a select key unit connected to the microprocessor means and operable so as to control operation of the

microprocessor means in a selected one of the program mode and the back-up mode;

5 a status indicating unit connected to and controlled by the microprocessor means to indicate operating status thereof;

10 a power supplying unit for supplying electric power to the floppy disk drive, the IC card interface unit, the disk drive controller, the random access memory, the microprocessor means and the status indicating unit; and

15 a card detector means, connected to the power supplying unit, for detecting presence of the IC card in the IC card slot, the card detector means permitting supply of electric power from the power supplying unit only when the IC card is present in the IC card slot.

Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiment, with reference to the accompanying drawings, of which:

20 Figure 1 is a top view of the preferred embodiment of an IC card back-up generating and programming device according to the present invention;

Figure 2 is a front view of the preferred embodiment;

25 Figure 3 is a rear view of the preferred embodiment;

Figure 4 is a schematic circuit block diagram of the preferred embodiment;

Figure 5 is a schematic electrical circuit diagram illustrating the card detector and the power supplying unit of the preferred embodiment;

5 Figure 6 is a schematic electrical circuit diagram illustrating the microprocessor and the select key unit of the preferred embodiment;

Figure 7 is a schematic electrical circuit diagram illustrating the disk drive controller and the status indicating unit of the preferred embodiment;

10 Figure 8 is a schematic electrical circuit diagram illustrating the IC card interface unit, the floppy disk drive and the random access memory of the preferred embodiment;

15 Figure 9 is a flowchart illustrating a main routine to be performed by the microprocessor of the preferred embodiment;

Figure 10 is a flowchart illustrating a programming routine to be performed by the microprocessor of the preferred embodiment; and

20 Figure 11 is a flowchart illustrating a back-up routine to be performed by the microprocessor of the preferred embodiment.

Referring to Figures 1 to 3, the preferred embodiment of an IC card back-up generating and programming device according to the present invention is shown to comprise a housing (A) with a status indicating unit and two select keys 31, 32 provided

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thereon. In this embodiment, the status indicating unit includes a power indicator 71, a copying indicator 72, a card error indicator 73, a disk error indicator 74 and a copy complete or "copied" indicator 75. The indicators 71-75 are preferably light emitting diodes. One of the select keys 31 is a program select key, while the other one of the select keys 32 is a back-up select key. The housing (A) is further provided with an IC card slot 21, an IC card lock/release switch 22 and an IC card eject switch 23. The housing (A) further has a floppy disk drive 60 and a DC 9V/0.8A power supply socket 8.

Figure 4 shows a schematic circuit block diagram of the preferred embodiment, while Figures 5 to 8 are schematic electrical circuit diagrams of the various circuit components of the device of the present invention. The IC card back-up generating and programming device is shown to comprise a microprocessor 10, a card detector 20, a select key unit 30, an IC card interface unit 40, a disk drive controller 50, a floppy disk drive 60, a status indicating unit 70, a power supplying unit 80 and a random access memory (RAM) 90.

The microprocessor 10 is responsible for controlling the programming and back-up operations of the device of the present invention. A flowchart of a main routine that is to be performed by the microprocessor 10 is

shown in Figure 5 and will be described in greater detail in the succeeding paragraphs.

The card detector 20 is used to control the supply of power to the device of the present invention.

5       The select key unit 30 includes the program select key 31 and the back-up select key 32 shown in Figure 1 and is operated so as to control the operating mode of the microprocessor 10.

10       The IC card interface unit 40 is connectable electrically to the IC card in the IC card slot 21 and permits electrical connection between the microprocessor 10 and the IC card.

15       The disk drive controller 50 is connected to and controlled by the microprocessor 10 so as to control reading and writing operations of the floppy disk drive 60 in order to effect reading and writing of a floppy disk in the floppy disk drive 60.

20       The status indicating unit 70 includes the indicators 71-75 shown in Figure 1 and is connected to and controlled by the microprocessor 10 so as to indicate the operating status of the device of the present invention.

25       The power supplying unit 80 is responsible for supplying electric power to the microprocessor 10, the IC card interface unit 40, the disk drive controller 50, the floppy disk drive 60, the status indicating unit 80 and the RAM 90.



The RAM 90 serves as a data storage device for storing temporarily data that is generated during the course of operation of the present invention.

Figure 9 is a flowchart which illustrates the main routine that is to be performed by the microprocessor 10. Referring to Figures 1, 4 and 9, before the power supplying unit 80 can supply electrical power to the various circuit components of the present invention, an IC card must be inserted into the IC card slot 21. The lock/release switch 22 is then operated in order to prevent the untimely removal of the IC card from the IC card slot 21. The card detector 20 permits the supply of electrical power from the power supplying unit 80 only after the lock/release switch 22 has been operated. Upon reception of electrical power from the power supplying unit 80, the microprocessor 10 waits for a pressed key signal from the select key unit 30. Upon detection that one of the select keys 31, 32 of the select key unit 30 has been pressed, the microprocessor 10 sets a flag corresponding to the pressed one of the select keys 31, 32. The microprocessor 10 then checks whether a floppy disk is present in the floppy disk drive 60. When a floppy disk is present in the floppy disk drive 60, the microprocessor 10 checks whether an identification code of the IC card is correct. This is necessary to prevent the use of the present invention to make unauthorized

copies of unlicensed IC cards. If the identification code is incorrect, the microprocessor 10 controls the status indicating unit 70 to cause the card error indicator 73 to light up. The operation of the present invention is then halted. If the IC card has a correct identification code, the microprocessor 10 controls the disk drive controller 50 so as to enable the floppy disk drive 60 to read the disk initialization data present in the floppy disk. If a read error is detected, the microprocessor 10 controls the status indicating unit 70 to cause the disk error indicator 74 to light up. The operation of the present invention is then halted. If no read error is detected, the microprocessor 10 controls the disk drive controller 50 so as to enable the floppy disk drive 60 to update the disk initialization data. The microprocessor 10 then controls the status indicating unit 70 to cause the copying indicator 72 to light up. The microprocessor 10 performs a programming routine if the flag corresponding to the program select key 31 was set. The microprocessor 10 performs a back-up routine if the flag corresponding to the back-up select key 32 was set.

Figure 10 is a flowchart which illustrates the programming routine that is to be performed by the microprocessor 10. Initially, the microprocessor 10 clears the IC card. If the microprocessor 10 is unable

to complete this operation, the microprocessor 10 controls the status indicating unit 70 to cause the card error indicator 73 to light up. The operation of the present invention is then halted. After clearing of the IC card has been completed, the microprocessor 10 then controls the disk drive controller 50 so as to enable the floppy disk drive 60 to read disk data from the floppy disk. If the floppy disk drive 60 is unable to read the disk data, the microprocessor 10 controls the status indicating unit 70 to cause the disk error indicator 74 to light up. The operation of the present invention is then halted. As long as no error was detected when reading of the disk data is being performed, the microprocessor 10 continues to receive the disk data from the floppy disk drive 60 and stores the same temporarily in the RAM 90. The microprocessor 10 then retrieves the data stored in the RAM 90 and provides the same to the IC card interface unit 40 so as to commence programming of the IC card. If a read error or a program error was detected while programming of the IC card is ongoing, the microprocessor 10 controls the status indicating unit 70 to cause the card error indicator 73 or the disk error indicator 74 to light up. The operation of the present invention is then halted.

The contents of the floppy disk have been transferred to the IC card after the programming

operation has been completed. At this stage, the microprocessor 10 controls the status indicating unit 70 to cause the "copied" indicator 75 to light up to indicate the completion of the IC card programming operation. The IC card is now ready for use.

Figure 11 is a flowchart which illustrates the back-up routine that is to be performed by the microprocessor 10. The microprocessor 10 reads the IC card data present in the IC card and stores the same temporarily in the RAM 90. The microprocessor 10 then retrieves the data stored in the RAM 90 and provides the same to the disk drive controller 50 so as to control the floppy disk drive 60 to write data into the floppy disk. As with the programming routine, if a read error or a write error was detected while writing of data into the floppy disk is ongoing, the microprocessor 10 controls the status indicating unit 70 to cause the card error indicator 73 or the disk error indicator 74 to light up. The operation of the present invention is then halted.

The IC card data in the IC card have been copied into the floppy disk after the back-up routine has been completed. At this stage, the microprocessor 10 controls the status indicating unit 70 to cause the "copied" indicator 75 to light up to indicate the completion of the back-up generating operation. The floppy disk can now be used to program another IC card.

CLAIMS:

1. An IC card back-up generating and programming device, comprising:

5 a housing provided with an IC card slot for receiving an IC card therein and a floppy disk drive for receiving a floppy disk therein;

an IC card interface unit connectable electrically to said IC card;

10 a disk drive controller connected electrically to said floppy disk drive;

a random access memory;

a microprocessor means connected to said interface unit, said disk drive controller and said random access memory;

15 said microprocessor means being operable in a program mode, wherein said microprocessor means controls said disk drive controller so as to enable said floppy disk drive to read disk data from said floppy disk and provide said disk data to said  
20 microprocessor means for storage in said random access memory, and wherein said microprocessor means retrieves said disk data from said random access memory and programs said IC card with said disk data;

25 said microprocessor means being further operable in a back-up mode, wherein said microprocessor means reads IC card data from said IC card and stores said IC card data in said random access memory, and wherein said

microprocessor means retrieves said IC card data from said random access memory and controls said disk drive controller so as to enable said floppy disk drive to write said IC card data into said floppy disk;

5        a select key unit connected to said microprocessor means and operable so as to control operation of said microprocessor means in a selected one of said program mode and said back-up mode;

10       a status indicating unit connected to and controlled by said microprocessor means to indicate operating status thereof;

15       a power supplying unit for supplying electric power to said floppy disk drive, said IC card interface unit, said disk drive controller, said random access memory, said microprocessor means and said status indicating unit; and

20       a card detector means, connected to said power supplying unit, for detecting presence of said IC card in said IC card slot, said card detector means permitting supply of electric power from said power supplying unit only when said IC card is present in said IC card slot.

25       2. The IC card programming and back-up generating device as claimed in claim 1, wherein said status indicating unit includes a power indicator, a copying indicator, a card error indicator, a disk error indicator and a copy complete indicator.

3. The IC card programming and back-up generating device as described substantially hereinbefore with reference to the accompanying drawings.

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**Patents Act 1977**  
**Examiner's report to the Comptroller under Section 17**  
**(The Search report)**

Application number  
 GB 9325042.1

**Relevant Technical Fields**

(i) UK Cl (Ed.M) G4A (AFL, AKBX)

(ii) Int Cl (Ed.5) G06F 9/24

Search Examiner  
 S J PROBERT

Date of completion of Search  
 2 FEBRUARY 1994

**Databases (see below)**

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE DATABASE: WPI

Documents considered relevant following a search in respect of Claims :-  
 1-3

**Categories of documents**

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| <p><b>X:</b> Document indicating lack of novelty or of inventive step.</p> <p><b>Y:</b> Document indicating lack of inventive step if combined with one or more other documents of the same category.</p> <p><b>A:</b> Document indicating technological background and/or state of the art.</p> | <p><b>P:</b> Document published on or after the declared priority date but before the filing date of the present application.</p> <p><b>E:</b> Patent document published on or after, but with priority date earlier than, the filing date of the present application.</p> <p><b>&amp;:</b> Member of the same patent family; corresponding document.</p> |
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X	GB 2204973 A (GENERAL ELECTRIC CO) see whole document	1-3
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X	WO 87/05420 A1 (DATA CARD CORP) see whole document	1-3

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